



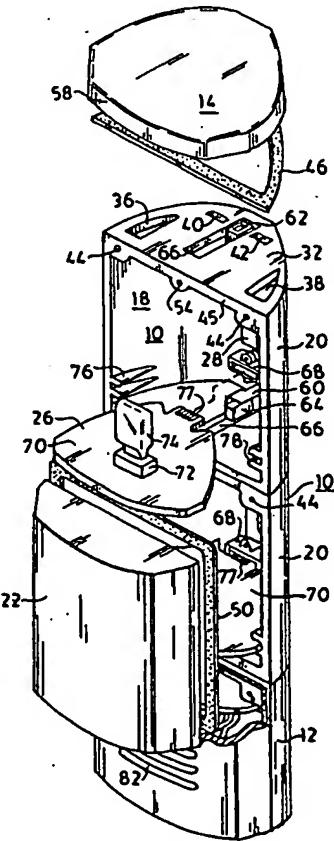
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claims and to be republished in the event of the receipt of
amendments.***(54) Title:** VISUAL SIGNALING DEVICE**(57) Abstract**

A visual signaling device has one or more light source modules (10). Each module (10) is of "Tri-liptic", i.e., generally triangular shape, but with the triangle corners rounded. Inside the triangle, is a perfect circle, to aid in the optical dispersion of the light source (74). The modules are each formed by back (18, 20) and front moldings (22). The light source module (10) contains light source (26) on a printed circuit board (70). This module also contains the electronics causing light source to flash, be illuminated constantly or a reflector to rotate around a stationery bulb (74). A conduit (60), which is a strip of printed circuit board with connectors at its opposite ends, extends between the top and bottom of each module of the stack. The board containing the light source is inserted via guides (76) into another connector which is attached to the conduit. The light source module (10) may readily be removed and may be interconnected into a stack by connection of the tops and bottoms of the back moldings of adjacent modules in the stack by means of interlocking projection and slots (36, 38). A cover (14) and a base (12) may be connected to the topmost and lowermost modules of the stack. The base may contain an audible warning source (82). The connection of the modules in the stack does not require separate rods or screws which extend through the entire stack.



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VISUAL SIGNALING DEVICE

Description

5

The present invention relates to visual signaling devices, and more particularly to
signaling lights which may be arranged in stacks of separate modules and provide
10 illumination of different color suitable for use in industrial plants and factories to indicate the
status (operating condition) of assembly lines and other apparatus therein. Such devices may
be called stackable beacons or signal towers.

Various signaling devices which are made up of modules which may be stacked in a
vertical array have been proposed and are even commercially available. The disadvantage of
15 such stackable modules is that they must be structurally rigid to withstand vibration and
mechanical impacts as are prevalent in industrial environments. They also must be operable
in various environmental conditions of humidity and contaminants. Accordingly, the design
of such signaling devices is complicated by means especially for inter-connection of the
modules into a stack, to render them rugged and environmentally stable, which makes such
20 devices difficult to manufacture and, otherwise, adds to their cost.

Another drawback of such devices is that it is difficult to change a burnt-out bulb or
to change the type of light source, for example a stationary lamp, for a rotating warning
lamp assembly, or to replace an incandescent warning lamp with a halogen lamp or other
light source. Such devices also do not contain strobe circuitry or LEDs, as may be desired
25 for certain signalling applications. In most cases the available stackable devices must be
totally disassembled in order to change light sources and even to replace burnt out bulbs,
especially where the environmental integrity of the internals of the modules is to be
maintained.

30

Accordingly, it is a principal object of the present invention to provide improved signaling devices, which are available as modules, which can be arranged individually on a base or in a stack one module above the other.

It is a still further object of the invention to provide improved stackable modules which have replaceable light source modules so that different types of light sources, for example incandescent, halogen, rotating strobe or LED sources may be used and interchanged as desired, and also for the purpose of retrofitting an already installed signaling device.

It is a still further object of the present invention to provide an improved visual signaling device made up of modules which can be stacked in a vertical array and which are essentially the same, and do not require special hardware, such rods as which extend through the entire stack, in order to assemble the modules into the stack.

It is a still further object of the present invention to provide improved visual signaling devices made up of modules which can be stacked, which modules have with fewer parts and lower fabricating cost than devices made up of stackable modules which have been proposed and/or which are now commercially available. It is a further object of the invention to provide an improved visual signalling device having a plurality of modules, each of which is a self contained unit, needing only to be supplied with power to work.

Briefly described, a visual signaling device embodying the invention has one or more modules, which may be identical. Each module is made up of a two part enclosing body or shell. Preferably the shell is generally triangular in cross section through the vertical axis of the module, but with rounded corners, thereby forming what is called herein a tri-liptic shape, since it has both triangular and elliptical characteristics. One part of the shell which forms two sides of the tri-liptic shape provides for the mounting of plates, such as printed circuit boards, containing light sources, which are referred to herein as light source modules. The tops and the bottoms of the shells have openings which enable them to be aligned and facilitate interconnection into a stack. A linear circuit board provides a conduit extending from the top to the bottom of each module. The circuit board is connected to an intermediate connector for receiving a connector of the light source module; the circuit board also having end connectors which connect to other modules and to an electric power source.

If desired a base unit may be provided with one or more modules arranged vertically above the base. The base unit may be a shell which contains an audible signaling device. A cover is preferably connected over the top of the upper most module to seal the unit. Preferably, after assembly of the module in a stack, a panel providing the part, which forms the 5 remaining side of tri-liptic shape, is attached to close the other part to the module, thereby providing an enclosure containing the light source which is sealed against adverse environmental affects.

Therefore, each module has a "tri-lptic" shape which is made of two parts, one of which provides the back thereof which provides mechanical support and facilitates stacking of 10 modules as well as a face which can accept a seal which seals the module when the other, or front of the tri-lptic shaped body, is attached to the back thereof. There is complete interchangeability of light source circuitry (incandescent, strobe, LED etc) without replacing or disassembling modules.

The foregoing and other objects features and advantages of the invention, as well as 15 the presently preferred embodiment thereof will become more apparent from reading of the following description in connection with the accompanying drawings in which:

FIG. 1 is an exploded, perspective view of a visual signaling device embodying the invention;

FIG. 1A is a view like FIG. 1 with some additional improvements;

FIG. 2 is a top plan view of the device shown in FIG. 1A;

FIG. 3 is a view of a visual signaling device similar to that shown in FIG 1, but having four instead of two modules;

FIG. 4 is a front elevational view of a visual signaling device having one module; and

FIG. 5 is a perspective view of the electrical, connections within each of the modules 25 shown in the other figures; and

FIG. 5A is a view similar to FIG. 5 of improved cabling and connections.

Referring to the drawings there is shown a visual signaling device having a plurality of modules 10 which are arranged in a vertical stack on a base 12. A cover 14 is attached over the upper most module. Each module has a generally tri-lptic shape, as shown in 30 FIG. 2. The tri-lptic shape appears in cross section, the cross section being taken through a

vertical axis 16 of the module and the stack. The tri-liptic shape has three sides 18, 20 and 22 which are arcuate and are tangential to a circle having a radius equal to a perpendicular to each side where it is tangent to the circle. One of the sides 22 is referred to herein, for the sake of simplifying the description, as the front side, while the other sides are referred to as
5 forming back sides of the module.

With the "tri-liptic" shape, flat edges are presented for providing a weather tight gasket seal. There is also a form factor which allows quick, easy and direct access for replacing lamps and/or circuits. Disassembly or removal of all modules located above the module to be relamped is not required. There is also greater stability than for a cylindrical
10 structure. The triliptic shape provides a larger illumination area than a cylindrical stack of lights, and also provides a highly distinctive appearance.

As shown in FIG 1, the back sides 18 and 20 are preferably formed as a one piece part, as by molding it out of plastic material, which may be transparent, translucent, or striated to provide a light diffuser. The front side 22 is a single part which also may be
15 molded from plastic and also may be of the same material and appearance as the back side. When assembled together, the sides form the tri-liptic shape and provide an enclosure or shell containing a light source module 26 and an electrical assembly 28, also shown in FIG. 5. Each module 10 has a top 32 and a bottom 34, which in the case of the top 32 and the bottom 34 of the rear sides of the module may be molded integrally with the sides 18 and
20 thereof. Also, the front side 22 has a top and a bottom, which is molded integrally with the face portion thereof.

The back side of the module provides the structural support which enables the modules to be stacked, as well as a housing for the light source module 26 and the electrical assembly 28. The top 32 has two generally triangular openings 36 and 38 and may have two
25 additional openings 40 and 42. Pins or protuberances (not shown) extend into these openings, from the bottom of the adjacent module of the stack, for alignment and for rigidly interconnecting modules to each other in the vertically stacked array. Other arrangements of openings (preferably at least three) are provided in the top 32 of each module. The protuberances may alternatively be in the bottoms and the openings in the top of adjacent
30 module. The base 12, and also the cover, has pins or projections (not shown) complimentary

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As shown in FIG 4, the base module 12 may have a threaded hole for receiving a pipe 80 which extends from the frame or apparatus on which the signaling device is mounted. Other forms of attachments, such as flanges on the base may alternatively be used. The base 12 may contain an audible signaling device of the type known in the art, and in such event holes 82 may be provided through which the sound may emanate. FIG 4 shows one module installed on the base. FIG 1 shows two modules and FIG 3 shows a stack of four modules.

Figure 1A shows top 32 having multiple looped protuberances 42 instead of openings. These pins or protuberances extend in to openings, from the bottom of the adjacent module 10 of the stack, for alignment and rigidly interconnecting modules to each other in the vertically stacked array. Modules are then firmly attached the adjacent module below it via some type of fasteners that connect into the protuberances of the module below it. Screws, clips, rivets, or the fastening devices such as the interlocking "key" 83, provide a rigid connection between modules that can be disassembled. Cap or cover 14 can be attached using screw 85 via screw hole 84.

The device of FIG. 1A uses the connector assembly of FIG. 5A uses the connector assembly of FIG. 5A. Parts described in connection with FIG. 5 are designated with the same numbers followed by an "a".

From the foregoing description it will be apparent that there has been provided an improved visual signaling device which is provided by modules which may be stackable without the need for external hardware. Also, light source modules are used which may be interchanged and retrofitted readily without disassembly of the entire stack of modules. Variations and modifications in there herein described visual signaling devices, within the scope of the invention, will undoubtably suggest themselves skilled in the arts. Accordingly, 25 the foregoing description should be taken as illustrative and not in a limiting sense.

CLAIMS

1. A visual signaling device which comprises at least one module having at least two parts which form an enclosure, an electrical assembly presenting connectors at the ends and intermediate thereof, and a light source module interchangeably contained in at least one of said parts and connectable to said intermediate connector, said module having means for connection together of said module with at least one more of said modules such that a plurality of said modules, are assembleable in a vertical array.
5
2. The device according to Claim 1 wherein said plurality of modules are in a stack forming said vertical array.
10
3. The device according to Claim 1 wherein said modules are of tri-lptic shape based on a perfect circle, having three sides, one part forming two of said sides of said module and the other part forming a third of said sides thereof.
4. The device according to Claim 2 whenever said modules each have a top and bottom between said sides and said connection means has inter-connections which extend between said tops and bottoms of said one parts of said modules to connect said one parts in said stack and provide rigid support for said stack.
15
5. The device according to Claim 4 wherein said light source module comprises a plate, a lamp on said plate, a cable in and a second connector extending from said plate and connectable to said first connector.
20
6. The device according to Claim 5 wherein said cable and a rigidifying member are integrated with each other to and said third and fourth connectors to provide said connection means.
7. The device according to Claim 1 further comprising means sealingly interconnecting said parts.
25
8. The device according to Claim 7 further comprising seals between said plurality of modules in said array.
9. The device of Claim 8 wherein said light source module has means for mounting on said plate different sources of illumination.

10. The device of Claim 3 further comprising a base of said tri-liptic shape on which said stack of modules is mounted at the bottom thereof.
11. The device of Claim 10 further comprising an audible source in said base.
12. The device of Claim 1 further comprising a cover of said tri-liptic shape attached to
5 said stack at the top end of the uppermost module thereof.

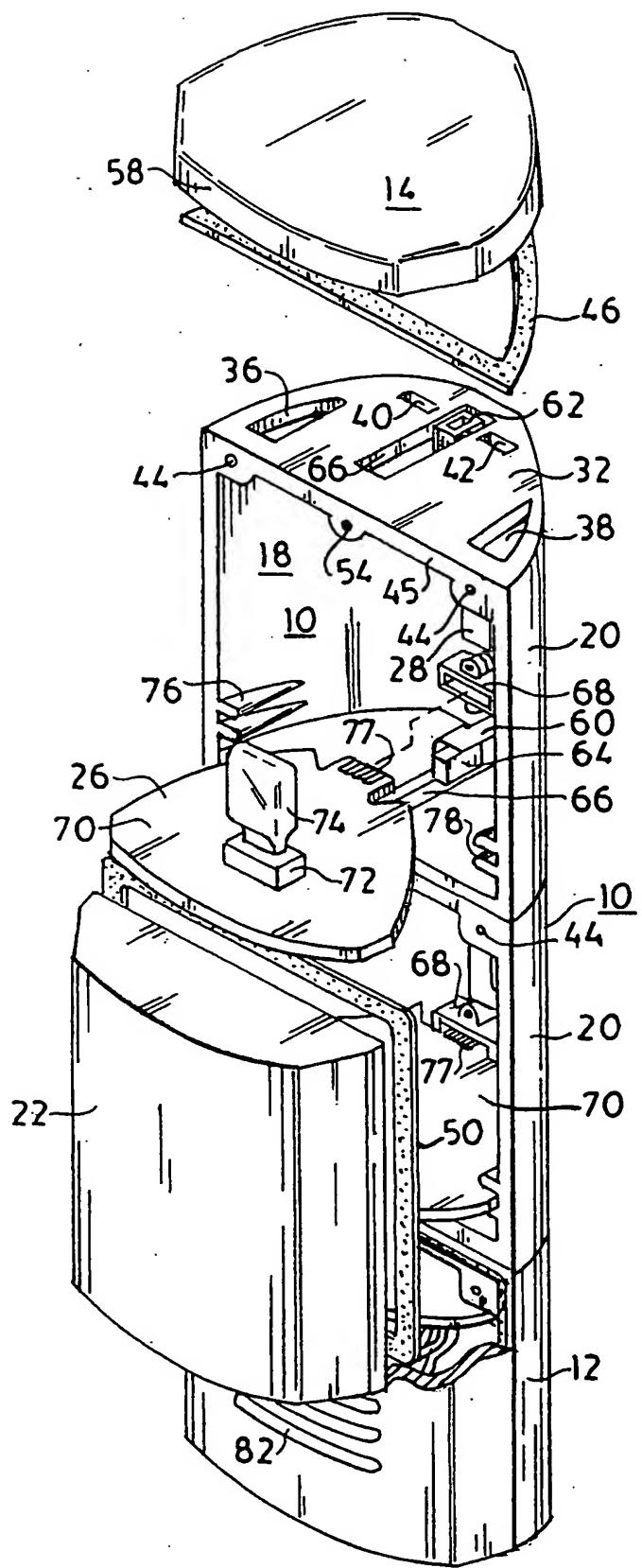


FIG. 1

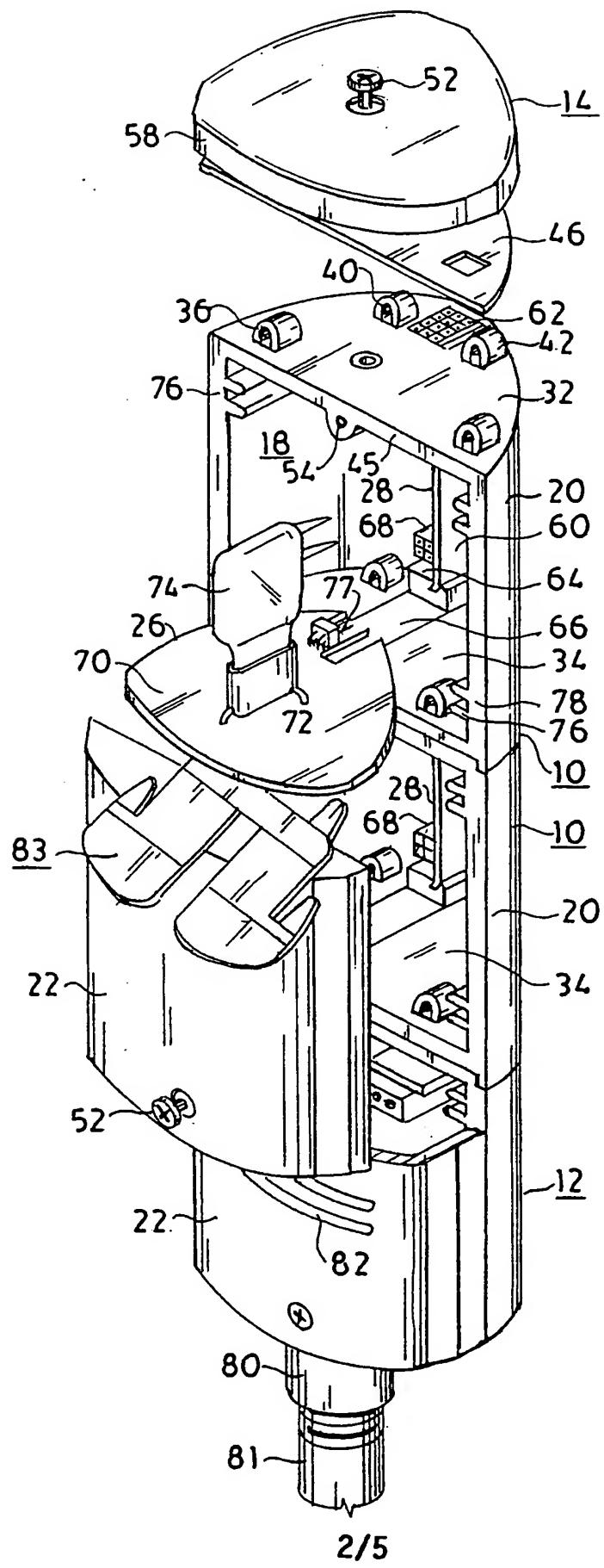


FIG. 1A

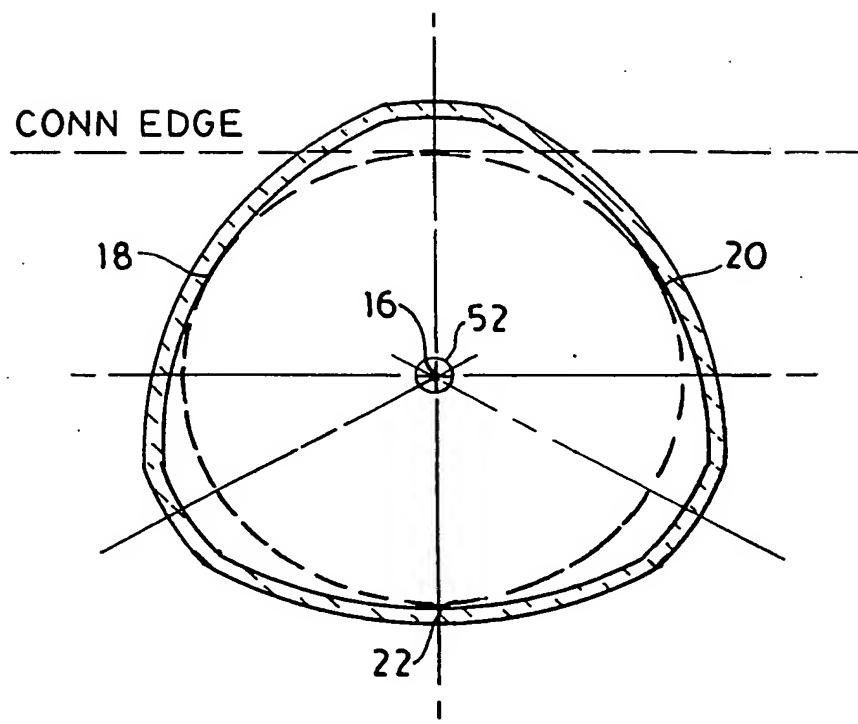
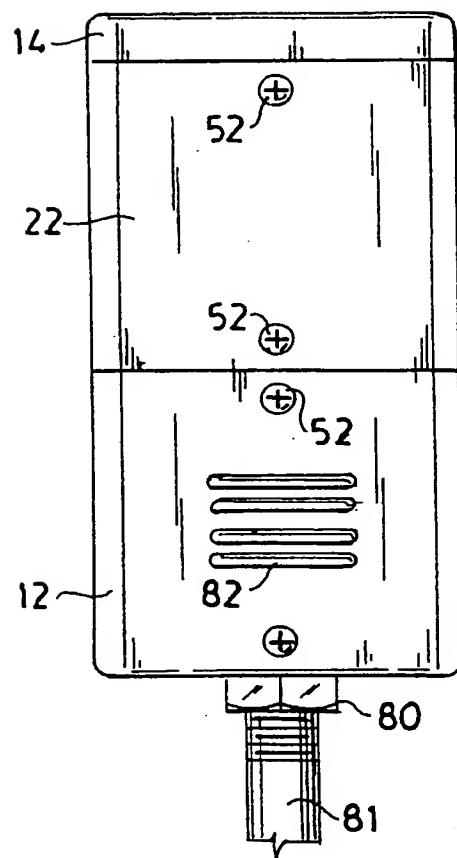
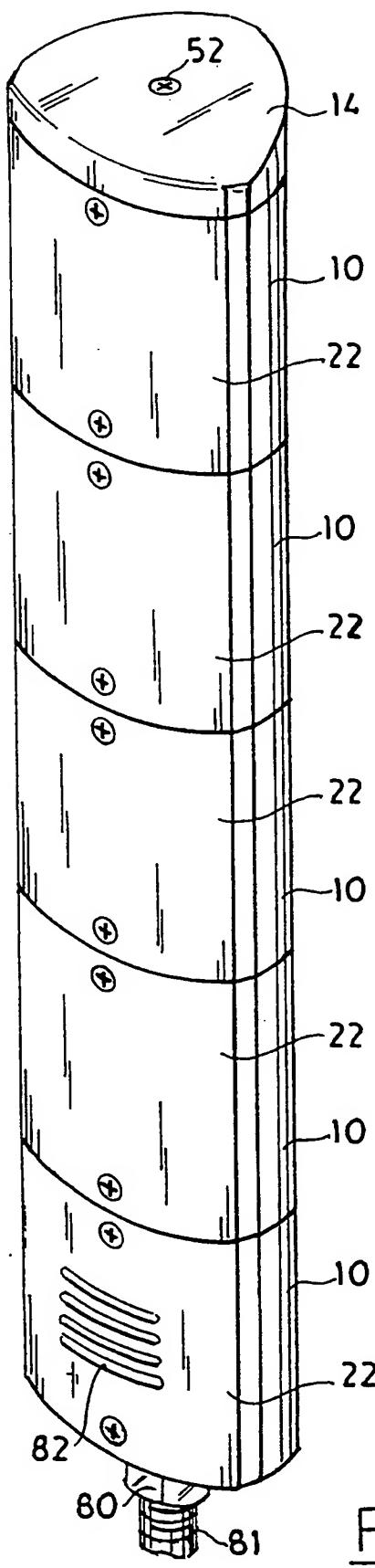


FIG.2



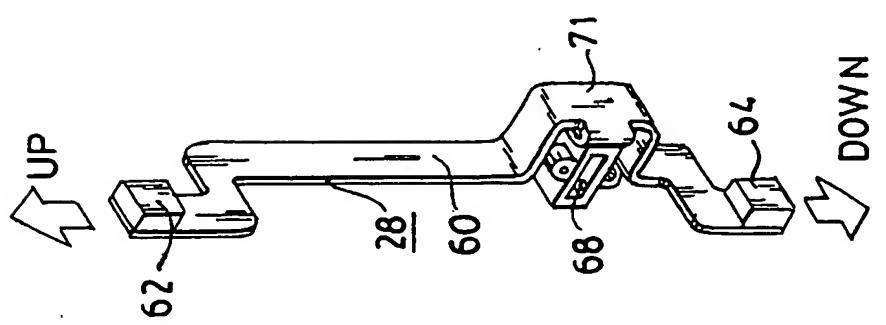
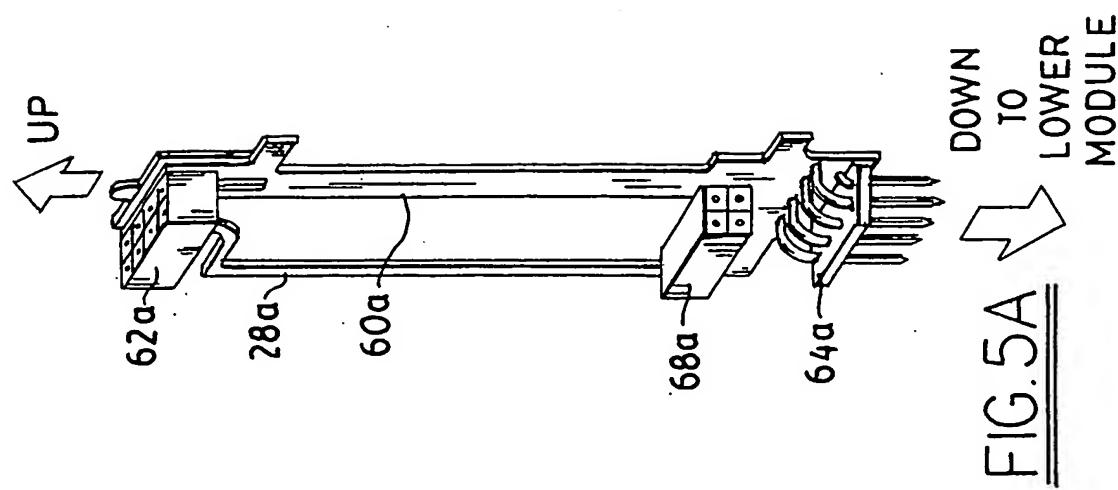


FIG. 5

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A. CLASSIFICATION OF SUBJECT MATTER

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Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,103,215 A (TAYLOR et al.) 07 April 1992, abstract, col. 1, lines 47-55, col. 4, lines 49-56	1-12
A	US 4,117,456 A (ALBRECHT) 26 September 1978	1-12
A	AU 8431-640 A (GREEN) 03 April 1985	1-12
A	US 4,232,362 A (WILLIAMS et al.) 04 November 1980	1-12

Further documents are listed in the continuation of Box C. See patent family annex.

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A. CLASSIFICATION OF SUBJECT MATTER:

US CL :340/321

340/321, 679, 691, 693, 815.56, 815.66, 815.67, 815.74, 907, 908, 908.1; 362/368, 226;
40/564; 116/63R, 63P, 63T

B. FIELDS SEARCHED

Minimum documentation searched

Classification System: U.S.

340/321, 679, 691, 693, 815.56, 815.66, 815.67, 815.74, 907, 908, 908.1; 362/368, 226;
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